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EXHAUST AFTERTREATMENT SYSTEM

The exhaust aftertreatment system consists of two units, the filtration and regeneration unit and the selective catalytic reduction SCR unit.

FILTRATION AND REGENERATION UNIT

The aftertreatment system primary function is to capture and oxidize (regenerate) the particulate matter (soot) in the engine exhaust gases and to reduce NOx. To achieve this goal, the exhaust aftertreatment system is split into two main sections: the exhaust gases first enter the **Diesel Oxidation Catalyst (DOC)** and **Diesel Particulate Filter (DPF)** assembly to capture and regenerate the soot on a regular or passive basis, then the exhaust gases flow through the **catalytic converter** to reduce NOx to minimum level. Through constant monitoring of the exhaust gas temperature and the system back pressure, EMS is able to manage regeneration.

Passive regeneration








Passive regeneration is the process by which the particulate matter is oxidized due to the heat generated by the engine internal combustion process. During normal highway operation, exhaust temperatures alone are usually high enough to oxidize accumulating soot. In low ambient temperatures, however, or in some stop-and-go applications, the system needs a little help to regenerate, or clean itself. This process is called "Extended heat Mode".

Stationary (parked) regeneration

In a small number of specific engine duty cycles, engine control module may not be capable of completing a regeneration through the "Extended heat Mode". In these situations, the operator will be notified that a stationary or parked regeneration may be required. A DPF telltale light will illuminate indicating the need for user interaction. The lamp gives the operator a grace period to allow this process to take place at a time when most convenient for the operator. This process requires the vehicle to be parked while a driver or maintenance technician initiates the regeneration process using the DID menus. Once initiated, the stationary regeneration process will be complete in about 45 minutes.

The driver will be notified of the need for a stationary regeneration (parked) by illumination of the DPF REGENERATION telltale light.

Diesel particulate filter clogging sequence – Instrument cluster telltale light

<p>LEVEL 1</p>	 solid	<p>REGENERATION NEEDED</p> <p><i>Diesel particulate filter is becoming full</i></p> <p><i>The DPF REGENERATION telltale light illuminates to notify the driver that a stationary regeneration (parked) will be required soon. When this lamp is lit, initiate stationary regeneration process at an appropriate time of day. THERE IS NO URGENCY AT THIS LEVEL.</i></p>
<p>LEVEL 2</p>	 flashing	<p>REGENERATION REQUIRED</p> <p><i>Diesel particulate filter full</i></p> <p><i>If no DPF regeneration occurs after the initial DPF REGENERATION telltale light illumination, the lamp will begin blinking and a stationary regeneration should be initiated as soon as possible in order to prevent from entering into Level 3.</i></p>
<p>LEVEL 3</p>	 flashing + 	<p>ATD SERVICE REQUIRED</p> <p>ENGINE DERATE ACTIVE</p> <p><i>Diesel particulate filter overfull</i></p> <p><i>If the flashing DPF REGENERATION telltale light is still ignored, the CHECK telltale light will illuminate. In that situation, engine performance is limited. Perform a parked regeneration IMMEDIATELY to avoid further derate and prevent from entering into Level 4.</i></p>
<p>LEVEL 4</p>	 flashing +  + 	<p>ATD SERVICE REQUIRED</p> <p>ENGINE SHUTDOWN ACTIVE</p> <p><i>A serious engine problem has occurred. The DPF may be over its maximum capacity.</i></p> <p><i>If a stationary regeneration is still not initiated, a standard Engine Protection Shutdown sequence will occur. All of the following dashboard lamps will be present:</i></p> <p><i>Blinking DPF REGENERATION telltale light;</i> <i>Solid CHECK telltale light;</i> <i>Solid STOP telltale light.</i></p> <p><i>Once engine derate and/or shutdown sequence is completed, a stationary regeneration must occur to continue vehicle operation. If the driver continues to operate the vehicle without regeneration, additional measures will be taken to protect the engine and ATD from damage, up to and including engine shutdown. Parked regeneration might no longer be possible.</i></p> <p><i>If engine protection has been initiated and forces the engine to shutdown, you CAN immediately re-start the engine and perform the necessary steps in order to initiate a stationary regeneration.</i></p>

Initiating a Stationary (Parked) Regeneration**NOTE**

At starting of the engine, if a stationary regeneration is required, the engine coolant temperature must reach 140°F (60°C) before any stationary regeneration may be initiated and completed. Permit the engine to idle for a short while or drive the vehicle until engine temperature increases sufficiently.

**WARNING**

Do not initiate a stationary regeneration in a closed area like a garage. Stationary regenerations must be undertaken outdoors only.

**WARNING**

During stationary regeneration, exhaust temperature may reach up to 842°F (450°C) at the particulate filter, it will go down to 788°F (420°C) after the catalytic converter and then will be further reduced to 554°F (290°C) at the diffuser outlet. Before initiating stationary regeneration, make sure that the DPF outlet diffuser is clear of objects and that no one is working near the DPF outlet diffuser.

**WARNING**

Hot surfaces. Keep yourself clear of all hot Aftertreatment Device components, particularly during and after active or stationary regeneration. Hot surfaces can cause serious burns.

NOTE**STATIONARY REGENERATION**

This process requires the vehicle to be parked while the driver or a maintenance technician initiates the regeneration process.

The DPF REGENERATION telltale light illuminates to notify the driver of the need and urgency of a manual stationary regeneration.



DPF REGENERATION telltale light

If stationary regeneration is not performed, this telltale light will blink, indicating that a stationary

regeneration is required immediately. If stationary regeneration is still not performed, “engine power derate and shutdown” sequence may occur as per level 1 to level 4 sequence.

To initiate a stationary regeneration:

- Park the vehicle in a clear area, vehicle speed must be 0 mph (0 km/h);
- Engine must be on normal idle and fully warmed up (coolant temperature above 140°F/60°C);
- Apply parking brakes and set the transmission to neutral (N).
- Press the DID ENTER button and then get to the DID Aftertreatment menu. Select sub-menu Request Parked REGEN and press ENTER button to confirm and initiate regeneration.

The regeneration will begin. Turn off the air conditioning to reduce engine load. The engine idling speed will increase to 1600 rpm. Once the regeneration is completed, the engine speed will return to normal idle.

Voluntary Interruption of a Stationary Regeneration

It is possible to interrupt a stationary regeneration at all time. To do so, set the ignition key to the OFF position or get to the DID's Aftertreatment menu, select Cancel REGEN and press ENTER button to confirm. You can stop regeneration simply by releasing the parking brake. Use this procedure in order to move the vehicle in a safe area.

If regeneration is interrupted, it is very important to reinitiate the regeneration as soon as possible.

SELECTIVE CATALYTIC REDUCTION UNIT


Selective Catalytic Reduction (SCR) is a technology that uses Diesel Exhaust Fluid (DEF) and a catalytic converter to reduce nitrogen oxides (NOx) emissions.

SCR is an exhaust aftertreatment system that injects small amount of DEF into the exhaust gas between the DPF and the selective reduction catalytic converter. DEF turns to ammonia and carbon dioxide when heated. The exhaust stream then passes over a catalyst, the ammonia reacts with the NOx to form nitrogen and water vapor.

The basic elements of the SCR system consist of a 15.9 gallons (60 liters) DEF tank complete with pump, lines and heating system, a dosing injector, a catalytic converter and the control and monitoring system.

Diesel exhaust fluid DEF

When handling DEF solution, it is important that electrical connectors to be connected or well encapsulated, otherwise there is a risk that the DEF will cause oxidation that cannot be removed. Water or compressed air will not help, since DEF quickly oxidizes certain metals. If a disconnected connector comes into contact with the DEF solution, it must be replaced immediately to prevent the DEF solution from creeping further into the copper wiring, which takes place at a speed of about 2.4 in (60 mm) per hour.

	<p>CAUTION</p>
<p>Diesel Exhaust Fluid (DEF) is a nontoxic aqueous solution of urea (32.5%) and ultra-pure water (67.5%). Urea is a compound of nitrogen that turns to ammonia when heated. The fluid is non flammable, and is not dangerous when handled as recommended. However, it is highly corrosive to certain metals, especially copper and brass.</p> <p>When detaching hoses and components, do not spill DEF on disconnected or unsealed connectors. If DEF is spilled on a disconnected or unsealed connector, the connector must be removed immediately and replaced.</p>	

Things to know about spilt diesel exhaust fluid (DEF):

- If urea solution comes into contact with the skin, rinse with plenty of water and remove contaminated clothing.
- If urea solution comes into contact with the eyes rinse for several minutes and call for medical help if necessary.
- If inhaled breathe fresh air and call for medical help if necessary.
- Do not allow the DEF solution to come into contact with other chemicals.

- The DEF solution is not flammable. If the DEF solution is exposed to high temperatures, it breaks down into ammonia and carbon dioxide.
- The DEF solution is highly corrosive to certain metals, including copper and aluminum.
- If the DEF solution is spilled onto the vehicle, wipe off the excess and rinse with water. Spilled DEF solution can form concentrated white crystals on the vehicle. Rinse off these crystals with water.

	<p>WARNING</p>
<p>DEF spilt onto hot components will quickly vaporize. Turn your face away!</p>	

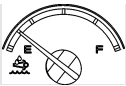

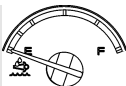

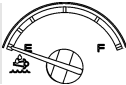

Diesel Exhaust Fluid (DEF) Consumption

DEF consumption is related to fuel consumption. In order to meet EPA2010 requirements, DEF tanks are sized so one refill will be necessary every two refill of the fuel tank.





Selective catalytic reduction – Driver warning and inducement

SCR system components must not be removed, altered or modified in any way. In order to protect the SCR system from tampering, inducement measures will occur if the following states are detected:

- Disconnection of DEF tank level sensor
- Blocked DEF line or dosing valve
- Disconnection of DEF dosing valve
- Disconnection of DEF pump
- Disconnection of SCR wiring harness
- Disconnection of NOx sensor

DEF TANK LEVEL			
DRIVER WARNING AND INDUCEMENT			
CONDITION	TELLTALE LIGHT AND MESSAGE IN THE DRIVER INFORMATION DISPLAY		INDUCEMENT
<p>There is only 2.6 gallons (10 liters) of DEF remaining in the tank. The actual DEF level gauge indicates about 12% DEF remaining.</p> 	 lighted solid	message: <ul style="list-style-type: none"> • DEF LOW 	None
<p>There is only 0.8 gallons (3 liters) of DEF remaining in the tank. The actual DEF level gauge indicates "Empty".</p> 	 Flashing	message: <ul style="list-style-type: none"> • DEF TANK NEAR EMPTY • ENGINE IN DERATE • ADD DEF 	Gradual engine torque reduction of 25%
<p>The DEF tank is empty and the DEF level gauge indicates "Empty".</p> <p>moreover</p> <p>a diesel fuel refueling is done and the diesel fuel level gauge increases <u>more than</u> 15% (approx. 34 gallons/130 liters)</p> <p>or</p> <p>the vehicle remains stationary (speed=0) for 20 min. with engine OFF or at idle.</p> 	 Flashing	message: <ul style="list-style-type: none"> • VEHICLE SPEED LIMITED TO 5 mph (8 km/h) • ADD DEF 	<p>Vehicle road speed limited (RSL) to 5 mph (8 km/h)</p> <p>The vehicle has to remain stationary before 5 mph (8 km/h) road speed limit becomes active</p> <p><i>NOTE: Repeated acts of tampering will result in more severe inducement.</i></p>

DEF QUALITY			
DRIVER WARNING AND INDUCEMENT			
CONDITION	TELLTALE LIGHT AND MESSAGE IN THE DRIVER INFORMATION DISPLAY	INDUCEMENT	
Poor DEF quality detected (dilution) Emission of initial diagnostic troubleshooting code (DTC).	CHECK lighted solid	message: <ul style="list-style-type: none"> • SCR PERFORMANCE LOW • ENGINE WILL DERATE SOON 	None
1 hour after poor DEF quality detection (chronological time after the initial tampering DTC emission).	CHECK lighted solid	message: <ul style="list-style-type: none"> • SCR MALFUNCTION • ENGINE IN DERATE • CHECK SCR TO AVOID 5 mph (8km/h) LIMIT 	Gradual engine torque reduction of 25%.
3 hours after poor DEF quality detection (chronological time after the initial tampering DTC emission) moreover a diesel fuel refueling is done and the diesel fuel level gauge increases <u>more than</u> 15% (approx. 34 gallons/130 liters) or the vehicle remains stationary (speed=0) for 20 min. with engine OFF or at idle.	CHECK lighted solid	message: <ul style="list-style-type: none"> • SERVICE SYSTEM SCR • 5 mph (8km/h) LIMIT 	Vehicle road speed limited (RSL) to 5 mph (8 km/h) The vehicle has to remain stationary before 5 mph (8 km/h) road speed limit becomes active
<p>Conditions to temporarily exit the 5 mph (8 km/h) road speed limit inducement</p> <p>First engine restart: At the first engine restart, the engine returns to the 25% torque reduction until proper DEF quality evaluation occurs. If poor DEF quality is detected during the next monitoring cycle then the 8 km/h (5 mph) speed limitation will resume after vehicle is stationary for 20 minutes.</p> <p>After the second engine restart, Premium Tech Tool is required to exit the 5 mph (8 km/h) RSL.</p> <p>With Premium Tech Tool: Invoke 25% torque reduction until proper DEF quality evaluation occurs. If poor DEF quality is detected during the next monitoring cycle then the 8 km/h (5 mph) speed limitation will resume after vehicle is stationary for 20 minutes.</p> <p>Repeating poor DEF quality within 40 hours since correction will resume the inducement stage.</p> <p>If correction occurs during road speed limitation, repeating poor DEF quality will invoke immediate 25% engine torque reduction, then 5 mph (8 km/h) road speed limitation upon vehicle stationary state of 20 minutes.</p>			

SCR SYSTEM TAMPERING		
DRIVER WARNING AND INDUCEMENT		
CONDITION	TELLTALE	INDUCEMENT
Tampering detected Tampering DTC pending.	 lighted solid	None
Tampering detected Tampering DTC confirmed.	 lighted solid	None
1 hour after tampering DTC detection (chronological time after the initial tampering DTC emission).	 lighted solid	Gradual engine torque reduction of 25%.
3 hours after tampering DTC detection (chronological time after the initial tampering DTC emission). moreover a diesel fuel refueling is done and the diesel fuel level gauge increases <u>more than</u> 15% (approx. 34 gallons/130 liters) or the vehicle remains stationary (speed=0) for 20 min. with engine OFF or at idle.	 lighted solid	Vehicle road speed limited (RSL) to 5 mph (8 km/h) The vehicle has to remain stationary before 5 mph (8 km/h) road speed limit becomes active.
<p>Correcting the SCR tampering condition will exit inducement.</p> <p>Repeating SCR tampering within 40 hrs since correction will resume the inducement at the same inducement stage and timer status existing at the time of correction.</p> <p>If correction occurs during road speed limitation, repeating tampering will invoke immediate 25% engine torque reduction, then 5 mph (8 km/h) road speed limitation upon vehicle stationary state of 20 minutes.</p>		

DRIVER INFORMATION DISPLAY (DID) MENUS

There are Driving and Non-Driving menus. Several sub-menus are password-protected while the vehicle is parked. The Non-Driving menu is accessible only when the vehicle is parked.

“DRIVING” MODE MENUS

Gauges

1. Outside Temperature
2. Engine Oil Temperature
3. Transmission Fluid Temperature
4. Compass
5. Accessories Air Pressure
6. A/C Compressor Pressure
7. Battery Voltage
8. Allison Transmission Oil Life

Fuel Data

1. Fuel flow
2. Trip Fuel Used
3. Distance to Empty

Time-Distance

1. Time and Date
2. Alarm Clock
3. Distance to Destination
4. Average Trip Speed
5. Estimated Time of Arrival (ETA)

Vehicle Messages

Reset Trip Data

“NON-DRIVING/STATIONARY” MODE MENUS

Display Settings

1. Language
2. Units
3. Time/Date
4. Favorite Display Setting
5. Display Light
6. Change Password

Diagnostics

1. View Active Faults
2. View Inactive Faults
3. Cluster Selftest
4. Part Number
5. Reset Inactive Faults
6. Vehicle Tests

Pre-Trip Assistant

1. Exterior Light Inspection
2. Air Leakage Monitor

Datalog

1. Vehicle ID
2. Total Data
3. Trip Data
4. Reset Trip Data

Aftertreatment

1. Request Parked REGEN
2. ATS Status
3. Cancel REGEN

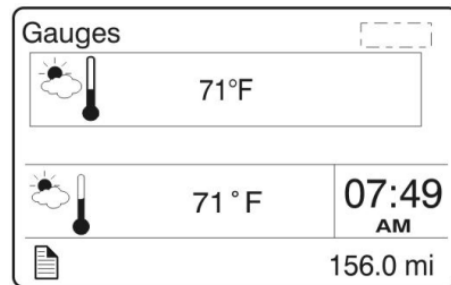
Password

1. Enter Password

GAUGES

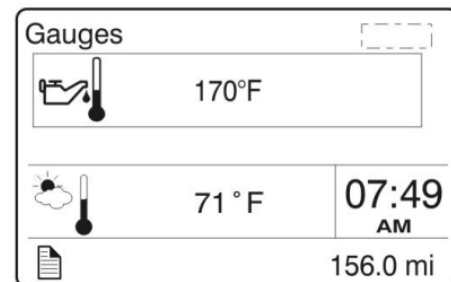
There are several gauges in this menu. The gauges are used to view current status of important functions in the vehicle.

1. Outside Temperature

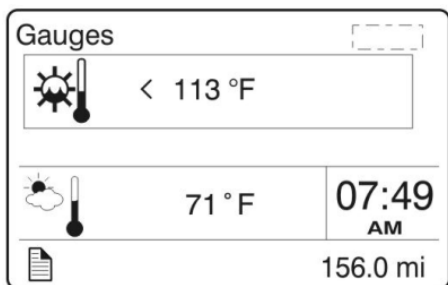


2. Engine Oil Temperature

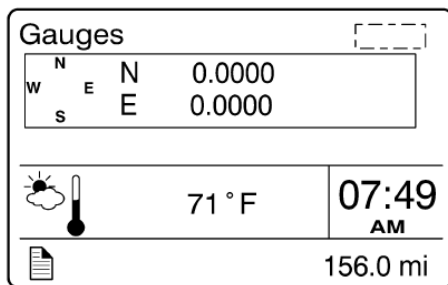
Selection of this gauge will display the engine oil temperature.



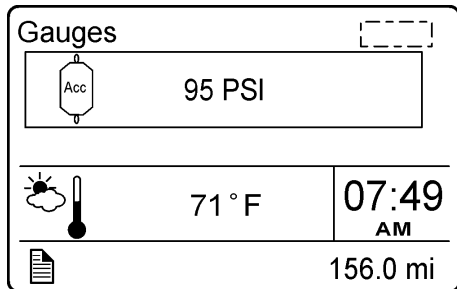
3. Transmission Fluid Temperature



4. Compass

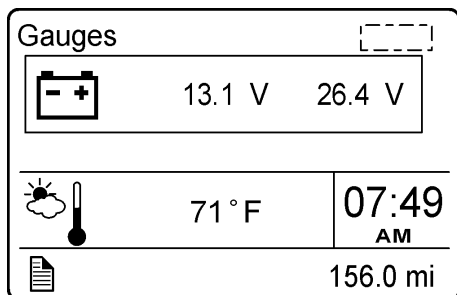


5. Accessories Air Pressure



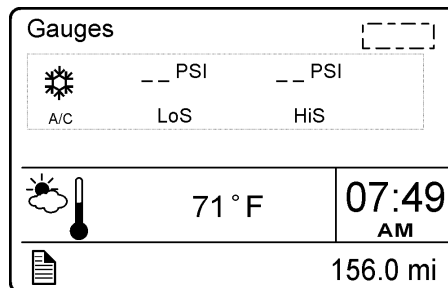
6. Battery Voltage

Displays the current 12-volts and 24-volts system voltage.



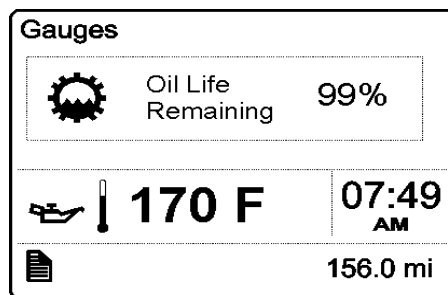
7. A/C Compressor Pressure

Displays the A/C compressor suction pressure value (LoS=low side) and discharge pressure value (HiS=high side).



8. Allison Transmission Oil Life

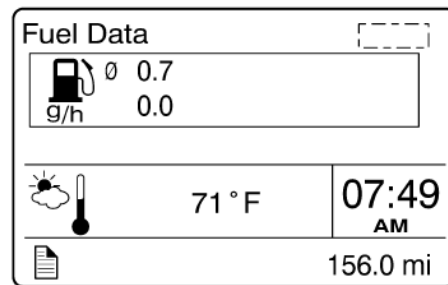
Displays the percentage of the calculated remaining life of the transmission oil. New oil is displayed as 99%. Refer to Appendix C for more details.



FUEL DATA

The Fuel Data menu provides information on the fuel consumption of the vehicle in various situations. For example, how much fuel has been used, how much fuel is remaining, how much fuel is remaining before refueling the vehicle.

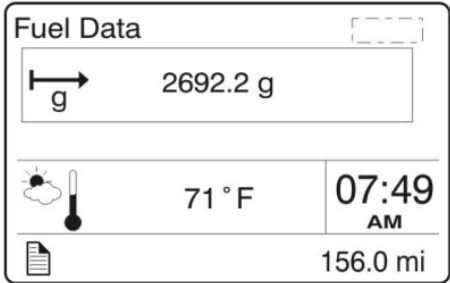
1. Fuel Flow (gph)



2. Trip Fuel Used

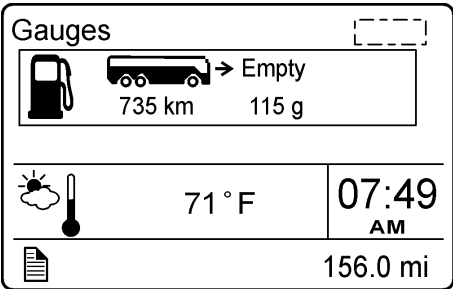
Indicates the total fuel consumption since the last reset.

NOTE: Use Reset function before each new trip.



3. Distance to Empty

Indicates the distance that can be traveled with the quantity of fuel that remains in the tank.

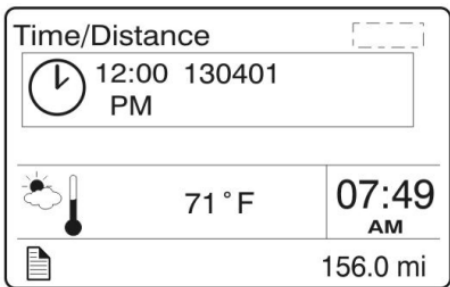


TIME/DISTANCE

The time and date can be set in the Time/Distance menu. The alarm clock can also be set from this menu. Following the alarm clock menu is the Distance to Destination selection, which allows the operator to see the distance to travel before destination. Average trip speed is also shown. By specifying the distance to your destination, the vehicle can calculate the estimated time of arrival (ETA).

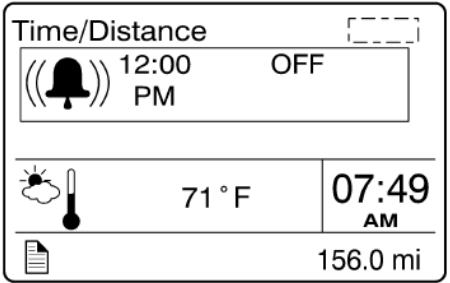
1. Time And Date

Adjust time and date with this menu. The instrument cluster has its own internal battery, so the date and date setting is keep in memory even if the vehicle's battery is disconnected.



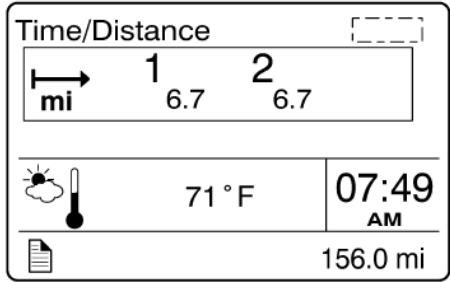
2. Alarm Clock

Use this function to program an alarm on the instrument cluster clock.



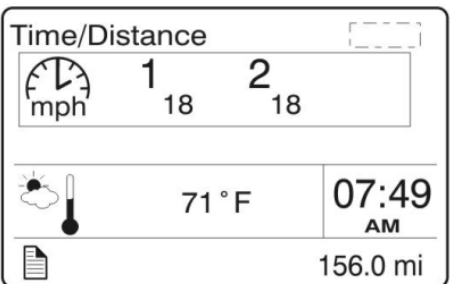
3. Distance to Destination

If the distance to be traveled before reaching the destination was entered in Estimated Time of Arrival (ETA) menu, this function will display the remaining distance to be traveled before reaching destination. Two independent driving distances can be entered, for example, 1 could be for leg 1 distance and 2 would be the entire trip.



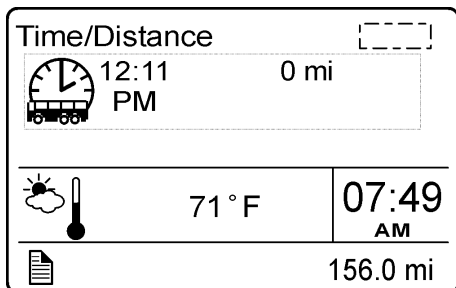
4. Average Trip Speed

This function displays the average speed for the current travel. The average trip speed is calculated as the distance traveled divided by the time the engine has been running (since the last reset). Two average trip speeds can be measured. Use Reset function before each new travel to start new measurements.



5. Estimated Time of Arrival (ETA)

This function will display the estimated time of arrival if the distance to be traveled is entered first, in this menu. To set distance to be traveled, press ENTER and enter the distance left to drive in mile or km using the DID control buttons.



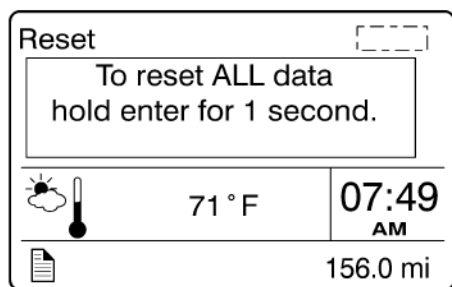
VEHICLE MESSAGES

Use this function to consult the vehicle active messages that were previously displayed as pop-up messages and then acknowledged. When consulting a message, the corresponding STOP, CHECK or INFORMATION warning light will illuminate. Scroll through the messages using the up/down button. Press ESC button to return to main menu.

RESET TRIP DATA

When the Reset Trip Data menu is open, pressing and holding down the Enter button for more than 1 second resets the functions listed below. This function will permit to the system to calculate new value from the point of resetting.

- Trip Fuel Used
- Average Trip Speed

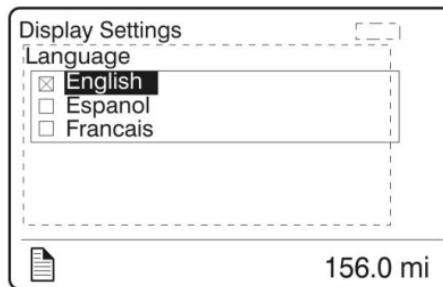


NON-DRIVING/STATIONARY MODE MENUS

DISPLAY SETTINGS

The Display Settings menu is used to change languages and units. The password, time and date can also be changed. The backlight and contrast of the display screen can be adjusted.

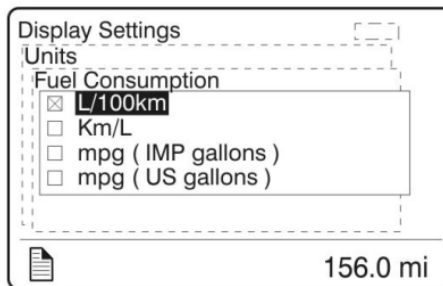
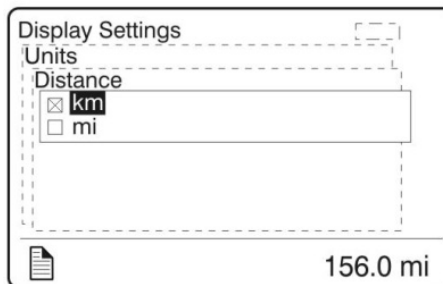
1. Language



2. Units

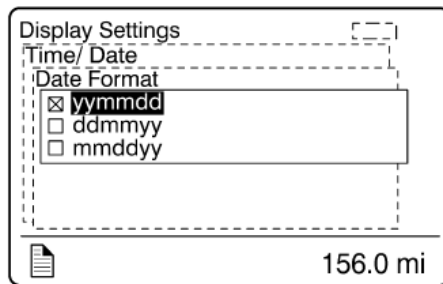
Use this function to select desired unit formats for:

- Distance (miles or km);
- Fuel consumption (km/l, l/100km, mpg US or IMP);
- Temperature (°C or °F).



3. Time/Date

Select the time and date format (am, pm, 24h) using this function.



4. Favorite Display Setting

Use this menu to select your favorite display gauges 1, 2 and 3 and replace the default gauges. On vehicles provided with the I-Shift transmission, Favorite Display Gauge 3 cannot be edited as it is kept for display of the transmission status.



Example: You wish to display the engine oil temperature at the Gauge 1 position.

1. Use UP/DOWN button until Gauge 1 position is selected.
2. Press ENTER button to confirm.
3. Use UP/DOWN button to scroll through the available gauges. When the engine oil temperature gauge is displayed, press ENTER button to confirm (repeat steps 1-3 to change Gauge 2 and Gauge 3 if needed).

5. Display Light

The Display Light menu has three sub-menus:

• Contrast

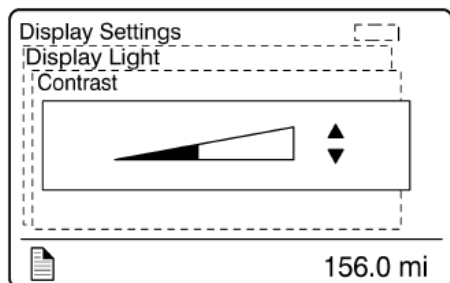
Adjust the contrast with the UP/DOWN button and press ENTER button to confirm.

• Backlight

In this menu, the display lighting can be adjusted relative to other instrument lighting with the UP/DOWN button.

• Night/Day

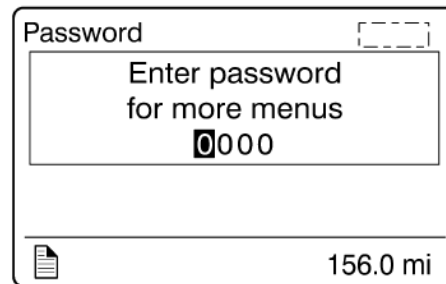
Use the Night/Day menu to choose a dark background with light text and images or a light background with dark text and images. Press ENTER button to toggle between Night and Day.



6. Change Password

Use this menu to change the current password. This menu is only accessible if the correct password is entered. The default password is 0000.

1. Mark which password is to be changed with the display UP/DOWN button.
2. Confirm with ENTER button.
3. Set the first digit with the UP/DOWN button.
4. Step to the next digit using ENTER button.
5. Step backwards with ESC button.

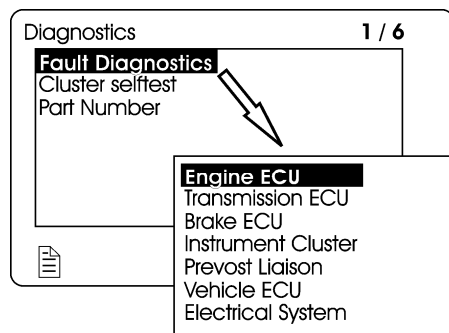


DIAGNOSTICS

The Diagnostics menu enables fault tracing on the control units in the vehicle to check for faults. Instrument tests are available to check the telltales, gauges, display and speaker. The part number of a control unit can be identified in the part number menu.

1. View Active Fault

A list of the control units on the vehicle is displayed. Use this function to check for active faults on specific control units.



2. View Inactive Fault

Use this function to check for inactive faults on specific control units.

3. Cluster Selftest

Use this menu to check proper functioning of the following components:

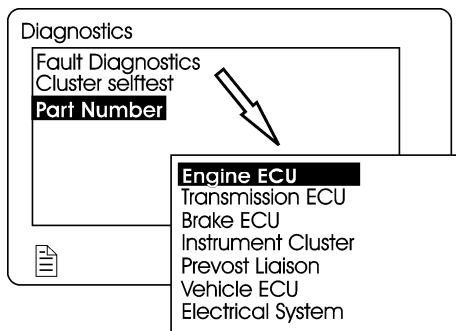
- Telltale lights
- Analog gauges
- Display
- Speakers

The following table describes the available tests. To cancel a test, press the ESC button).

Telltale lights test	Telltale lights illuminate for approximately five seconds. Press the Esc button to cancel the test.
Analog gauges	The indicators move forwards and backwards between the end positions. They do not show any particular value. This is just a check to confirm that the indicators move, and to make sure the operators are working. Press the Esc button to cancel the test.
Display test	The entire display lights up until the Esc button is pressed.
Speaker Test	A sound is emitted through the speakers. Press the Esc button to cancel the test.

4. Part Number

A list of the control units on the vehicle with their part numbers is displayed in the Part Number menu.

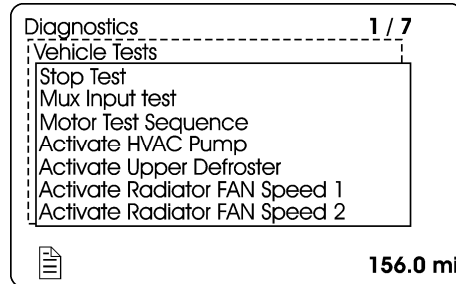


5. Reset Inactive Faults

Use this menu to delete an inactive fault for a particular control unit. Note: it is not possible to delete inactive faults of the Engine ECU.

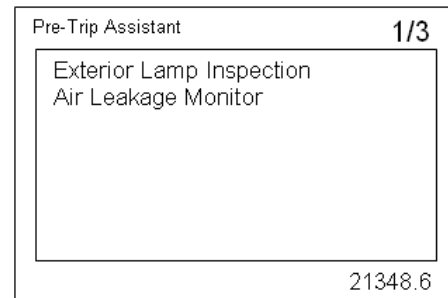
6. Vehicle Test

Use this menu to perform tests of the dashboard switches. You can also test some electrical components with this menu (electrical motors, contactors, etc.). For more information, refer to section 06: Electrical, under “Test mode for electric motors” paragraph of the Maintenance Manual.



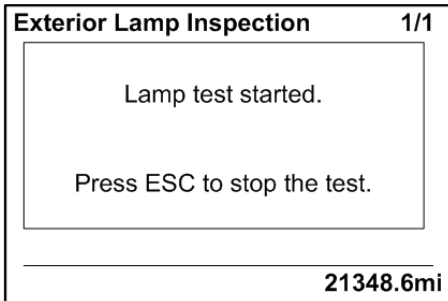
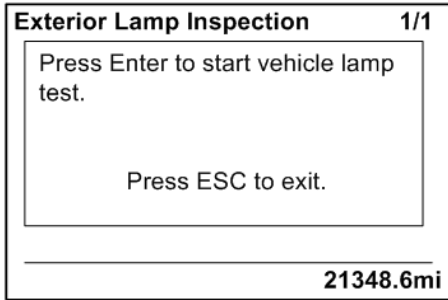
PRE-TRIP ASSISTANT (option)

The Pre-Trip Assistance option is a tool to assist the driver in completing the pre-trip inspection of the vehicle. This option is not a substitute for a complete pre-trip inspection. If any system of the vehicle does not pass inspection, the error must be corrected before operating the vehicle. The available pre-trip tests include the Exterior Light Inspection check, and the Air Leakage check.



1. Exterior Light Inspection

The Exterior Light Inspection check repeatedly turns all exterior lights on/off for the vehicle. This allows the operator to start the test, exit the vehicle and do a visual check that all exterior lighting is functioning properly.

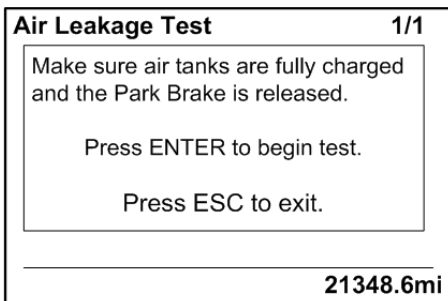


2. Air leakage Monitor

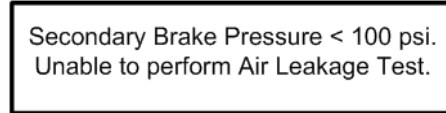
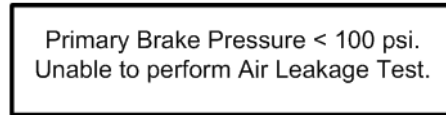
The Air Leakage check allows the driver to accurately measure the amount of air pressure drop in the front and rear brake air systems. After selecting this test from the DID, you are prompted to apply the service brake for 60 seconds. After applying and holding the service brake for 60 seconds, the DID will display the amount of pressure drop in the brake system.

Before starting the test through the DID, complete the following:

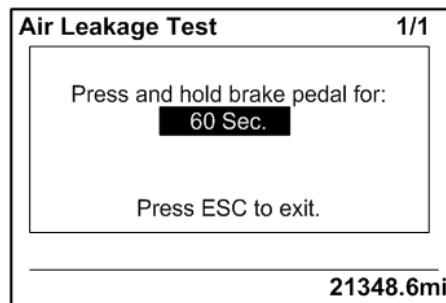
- a. Start the engine and check that the brake systems air pressure is greater than 100 psi.
- b. Turn engine off.
- c. Release the brakes and allow the system to settle (air gauge needle stops moving).
- d. Press the ENTER button to start the test.



- e. If the air tanks pressure is too low to perform the test (pressure must be greater than 100 psi), the following messages will appear.



- f. You must press and hold brake pedal for 60 seconds, as instructed.



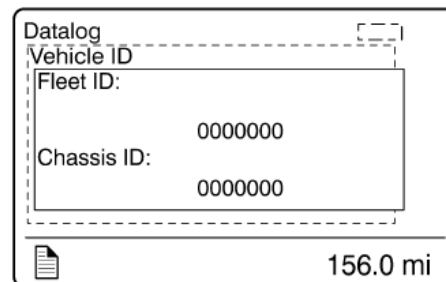
- g. Once the brake pressure test is completed the pressure leak test results are displayed.

Tank	Before	After	Drop
F	127	127	0
R	129	129	0

(1)VEC 2044.6mi

DATA LOG

1. Vehicle ID

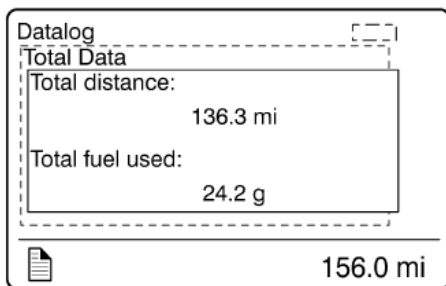


2. Total Data

Total Data menu indicates the accumulated engine values that have been logged during the lifetime of the engine ECU.

Available information:

- Total distance traveled
- Total fuel used
- Total engine hours
- Total idle time
- Total PTO hours
- total engine revolutions

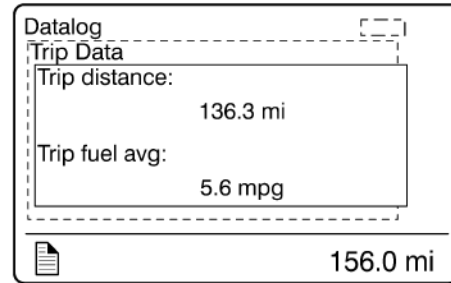


3. Trip Data

This menu displays the trip information listed below. This function must be reset before each measurement (before each new trip or leg) using the Reset Trip Data menu.

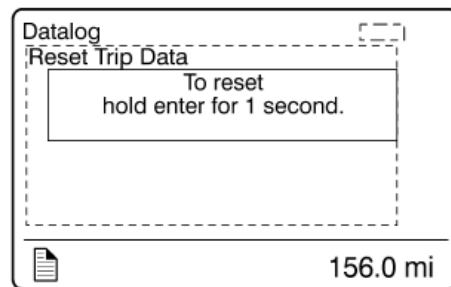
Available information for the trip or leg is:

- Trip distance (miles or km)
- Trip fuel average (mpg, liter/100km; km/liter)
- Trip fuel used (gallons or liters)
- Trip duration on cruise control (hours)
- Trip duration with engine rpm greater than economy rpm (hours)
- Trip duration while engine rpm is greater than the desire maximum rpm RPM Limit set in Fleet Limits sub-menu (hours)
- Trip fuel used with engine rpm greater than the economy rpm (gallons/liters)
- Trip average speed (mph, km/h)
- Trip duration with speed greater than the maximum desired speed as set in Fleet Limits sub-menu (hours)
- Trip engine hours
- Trip duration on engine idle (hours)
- Trip fuel used while in engine idle (gallons, liters)



4. Reset Trip Data

This menu can only be accessed if the correct password has been entered. Use this function to reset measurements of the Trip Data menu before each new trip or leg.

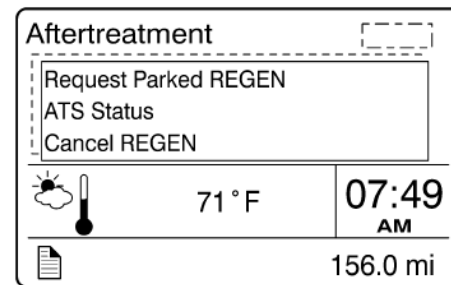


AFTERTREATMENT

This menu permits to the driver to initiate a stationary regeneration, to check the status of the aftertreatment system and to interrupt regeneration.

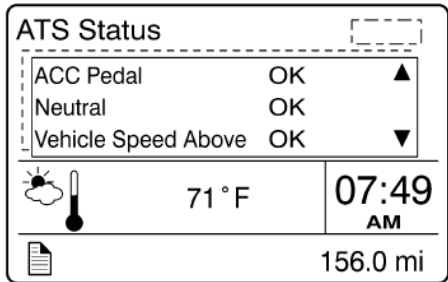
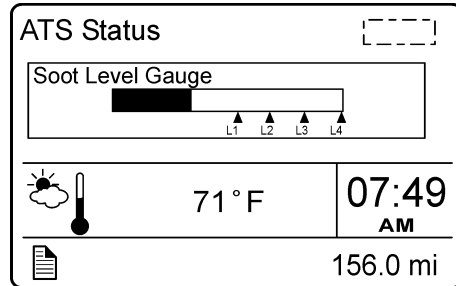
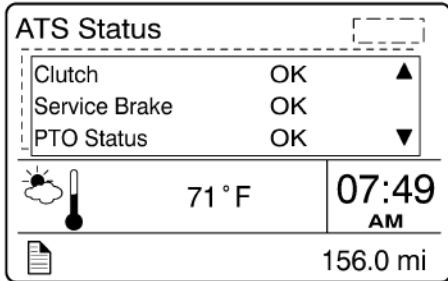
1. Request Parked REGEN

Use this function to initiate a stationary (parked) regeneration.



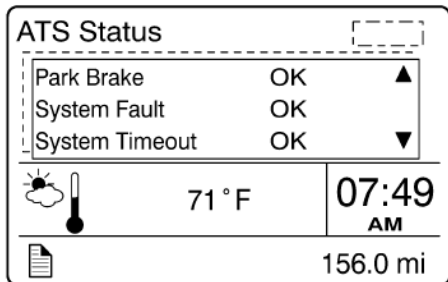
2. ATS Status

The Aftertreatment status sub-menus provide information about the conditions required for performing regeneration. The status can be OK (regeneration allowed), CHECK (regeneration not allowed) or N/A (not applicable). When ATS Status is selected, the following sub-menus are available.



3. Cancel REGEN

From the Aftertreatment main menu, you can cancel a REGEN cycle.



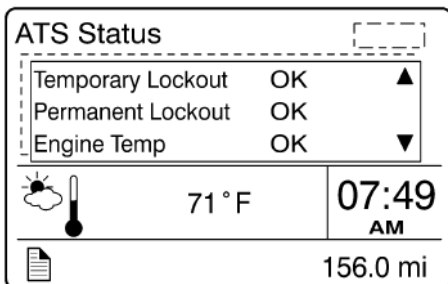
PASSWORD

Certain functions are password-protected. These passwords give the user access to all password-protected functions. The default password is 0000.

1. Password

The following menus are password-protected and marked with a key symbol in the menus:

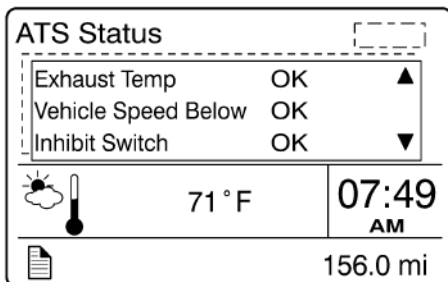
- Change Password
- Fleet ID
- Reset Trip Data
- Fault Diagnostics
- Inactive Faults



TRANSMISSION RETARDER

The transmission retarder is a device that helps to reduce the speed of a vehicle. It improves vehicle control, increases driving safety and permits more economical operation. The retarder provides slowing power when it is most needed, such as when descending mountain roads, in stop-and-go traffic and on crowded freeways.

The transmission retarder is a vehicle-slowng device, not a vehicle-stopping device. It is not a substitute for the service braking system. The service brake must be used to bring the vehicle to a complete stop.



Soot Level Gauge

From the ATS Status sub-menu, you can view the soot level for the Aftertreatment system. When the soot level is high, regeneration is necessary. L1, L2, L3 and L4 under the scale correspond to Level 1 up to Level 4 (see Diesel particulate filter clogging sequence – Engine indicator lamp).

NOTE

Extended use will raise the temperature of the transmission fluid.

The retarder is provided with a switch located on the L.H. dashboard panel (refer to "CONTROLS AND INSTRUMENTS" chapter).

NOTE

Deactivating the transmission retarder will turn the indicator light located at the front of the coach ON.

The retarder helps reduce speed on grades without using the vehicle's conventional service braking system. This virtually eliminates brake overheating and reduces the risk of a runaway vehicle. A retarder greatly increases the service life of brake pads and discs, resulting in reduced brake maintenance costs.

NOTE

The stoplights automatically illuminate when the vehicle is slowing down after application of the transmission retarder.

NOTE

For vehicles equipped with the Antilock Braking System (ABS), as the wheels start to lock up on slippery roads, the output retarder automatically deactivates until the wheels roll freely.

ANTILOCK BRAKING SYSTEM (ABS)

The purpose of the Antilock Braking System (ABS) is to maintain vehicle stability and control during braking and to minimize the stopping distance in any road condition.

On slippery roads and more generally in emergency situations, over-braking frequently induces wheel locking. Wheel locking greatly increases breaking distance on any road surface. Locked wheels also impede directional control and cause severe tire abrasion. An antilock braking system provides maximum braking performance while maintaining adequate control on slippery roads.

The basis of ABS is constant monitoring of wheel parameters during braking. Sensors on each wheel of the front and drive axles constantly measure wheel speed during braking. This information is transmitted to a four-channel electronic processor which senses when any wheel is about to lock. Modulating valves quickly

adjust brake pressure (up to 5 times every second) to prevent wheel lock. Each wheel is therefore controlled according to the available grip.

In this way, the vehicle is brought to a stop in the shortest possible time while remaining stable and under the driver's control.



WARNING

Vehicles following ABS-equipped vehicles may not be able to brake as fast on slippery roads.

KNEELING SYSTEM

This system lowers the front end, enabling passengers to get on and off the coach without any difficulty.

NOTE

This coach is equipped with an interlock system which automatically applies the parking brake when the kneeling system is activated.

To operate, stop the coach, set the transmission to neutral (N), then push down the rocker switch located on the dashboard. (Refer to "Controls & Instruments" chapter). The parking brake will be applied automatically and a status line pictogram will appear on the DID to indicate that the front of the coach is being lowered.

To raise the front of the coach to its normal height, push up the rocker switch. The front end will rapidly rise up. The system will release the parking brake and shift the transmission to the previously selected range.



CAUTION

Avoid parking the coach too close to the sidewalk or to other obstacles which could damage the coach during kneeling.

NOTE

Kneeling is disabled when the entrance door is open.

NOTE

The kneeling system does not operate when the coach is traveling over 5 mph (8 km/h). Consequently, the driver cannot inadvertently operate the kneeling system at higher speeds.

UNLOADING TAG AXLE

To reduce the turning radius, the air springs pressure will be automatically reduced by 75% when the coach is moving at speed lower than 5 mph (8 km/h) and with more than 1½ turn from the steering.

RETRACTABLE TAG AXLE

The standard tag axle retraction system is controlled by a valve located on the right lateral console. The valve can be switched to either the WHEELS UP or WHEELS DOWN position. The axle will be raised or lowered by air pressure according to the valve position. Refer to "Controls & Instruments" chapter.

The tag axle service brakes operate only when the tag axle is in the WHEELS DOWN position. Never lower the tag axle while the coach is moving. When the tag axle is in the WHEELS UP position, the corresponding indicator light will illuminate. The indicator light will start flashing and an audible alarm will sound to warn the driver if the vehicle speed exceeds 12 mph (20 km/h) with tag axle raised. The tag axle can be raised in tight maneuvering areas like in a parking lot or to make it easier to turn a short corner. The tag axle shortens the wheelbase and allows tighter turning. Raising the tag axle transfers extra weight and additional traction to the drive wheels providing improved control on slippery roads.



CAUTION

Do not use tag axle in raised position for an extended period. Raising tag axle increases load on the drive axle, suspension and tires.

Do not drive vehicle with tag axle raised when speed is exceeding 12 mph (20 km/h).

In order to prevent damage to the suspension, always raise the tag axle before lifting the coach.

IN-STATION LIGHTING

The in-station lighting system circuit is linked with the battery charger: When the charger is connected to an external power source, the in-station lighting circuit can be energized without depleting the batteries.

The receptacle used for the battery charger is located on the engine compartment. R.H. side door.

WHEELCHAIR LIFT SYSTEM

Read and understand the RICON Service/Owner Manual before attempting to use the wheelchair lift. The instructions below are a quick reference and serve to complement the information provided by RICON.



WARNING

To operate the optional wheelchair lift, the coach must be parked on a flat and level surface, with the parking brake applied.

Activate the lift mechanism circuit by pressing down on the wheelchair rocker switch on the dashboard.

WHEELCHAIR LIFT AND ACCESS DOORS

The wheelchair access door swings to the side and is maintained open by a locking mechanism. Open the wheelchair access door completely until it locks in the open position. To close the door, pull on the tab located on the inside of the door and slam the door shut.

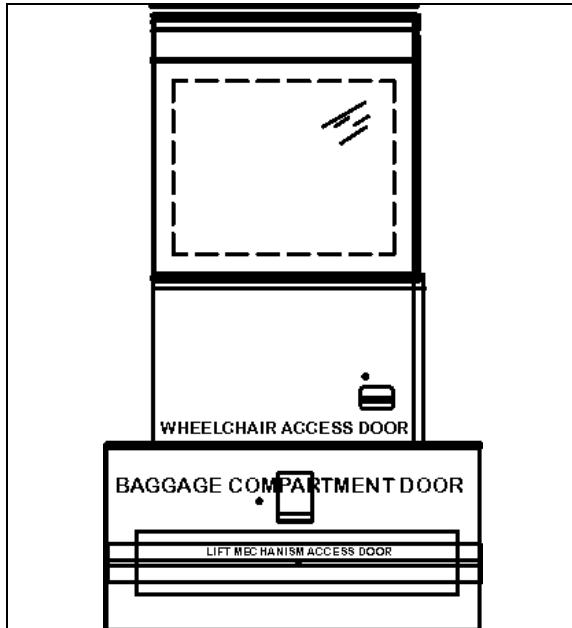
A light inside the vehicle illuminates the doorway when the wheelchair access door is open.

A telltale light on the dashboard illuminates when the lift mechanism access door or the wheelchair access door is open. Refer to Controls and Instruments chapter.

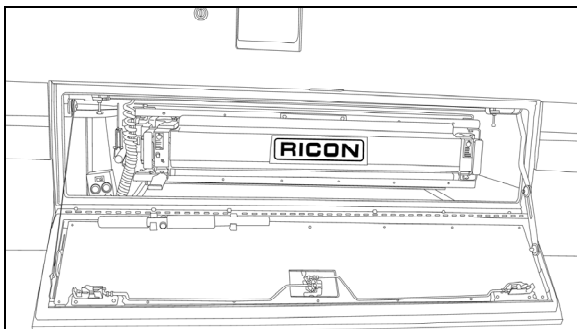
When either the lift mechanism access door or the wheelchair access door is open, the parking brake cannot be released and the transmission gear selector will not register any gear selection.

The activation switch must be in the ON position for this interlock feature to be in effect.

If in motion and the access door opens, a telltale light will illuminate and an audible alert will sound.



WHEELCHAIR LIFT AND ACCESS DOORS 18615



OPENING LIFT MECHANISM ACCESS DOOR 18616

OPERATING THE WHEELCHAIR LIFT



WARNING

Inspect the lift before each use as described in the RICON Owner's manual. If any unsafe condition exists, or if unusual noises or movements are noticed, DO NOT use and contact an authorized RICON dealer for repair.



WARNING

Read and comply with all warning labels and symbols affixed to the wheelchair lift.



WARNING

Do not operate with a load in excess of 660 lbs (300 Kg).

The coach must be parked at least 10 feet (3 meters) away from other vehicles or large objects. Toggle the POWER switch to the ON position and then control each lift motion by pressing on the appropriate button. The POWER switch provides power to the pendant and thereby enables the lift. When toggled on, the power switch and each button illuminate. When operating the lift, be careful the control wire doesn't bind with the lift mechanism.

Using the handheld control pendant, deploy the lift by pressing on the DEPLOY button.

Lift the platform to a 2/3 height position before opening the wheelchair access door.



CAUTION

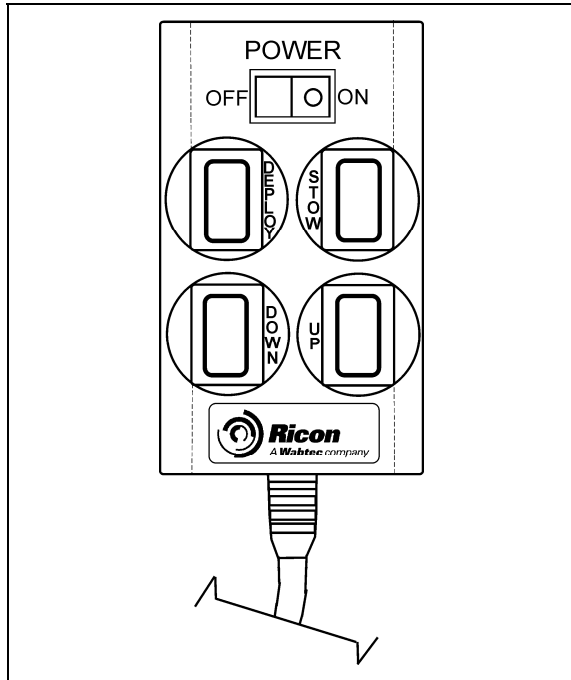
Make sure the wheelchair access door is opened completely, if not, the platform will stop when it reaches 3/4 height position to prevent damages to the vehicle side.

When the lift begins to deploy, it is normal to hear a clutch action of one or two clicks should be heard. Once deployed, lift the handrails until locked in vertical position. Buckle the restraint. Use the UP and DOWN buttons to raise or lower the platform. Upon reaching the top or the bottom of its stroke, the appropriate rollstop will lower.

NOTE

The restraint belt acts as a safety device and it prevents raising or lowering the lift when not buckled.

Roll the wheelchair onto the platform with the wheelchair facing outwards because the front rollstop is not designed to keep the large rear wheels of a wheelchair from rolling off the platform.



CONTROL PENDANT

23421



WARNING

Use extreme care when rolling on or off the platform and lock the wheelchair brakes while stationary on the platform. Make sure the wheelchair fits safely on the platform. Keep arms and legs away from moving parts.

NOTE

The indicator light on the control device illuminates when power is supplied (when the lift electrical circuit is activated by the switch on the dashboard).

To stow the platform, detach the restraint belt and fold the left handrail, then fold the right handrail (lift the slam lock handles to fold handrails). Re-fasten restraint belt. Press down and hold the STOW button until the lift is fully stowed.

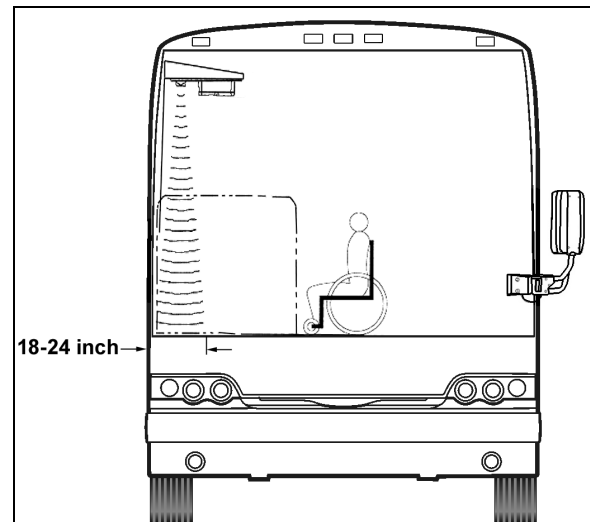
THRESHOLD WARNING SYSTEM (TWS) ADJUSTMENT

There are three verifications to perform; 1) Adjust Aiming of Acoustic Sensor Beam, 2) Test Aim of Acoustic Sensor Beam, and 3) Adjust Acoustic Sensor Timing.

Adjustment of the sensor timing is done at the factory and should not need to be repeated in the field. Readjustment should only be considered if the sensor aiming could not be adjusted to ignore both the wheelchair in the aisle and the platform during its normal movement.

Adjust Aiming of Acoustic Sensor Beam

1. Place wheelchair with passenger in center aisle of coach, pointed at doorway where Threshold Warning System (TWS) is installed. The TWS should not detect a wheelchair and passenger when they are located this far from doorway.
2. Turn power to lift on (LED on TWS module will light steady) and indicator light on the control device illuminates. If wheelchair and passenger are detected by acoustic sensors the LED will flash, the buzzer will sound and the module red light will flash. If this occurs it is necessary to adjust aiming of sensors.



TWS AREA

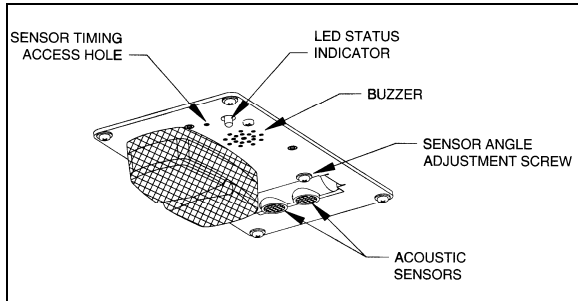
23371

3. Turn sensor angle adjustment screw clockwise to move direction of beam away from center aisle and towards doorway. Stop adjustment when LED ceases to flash.

NOTE

Only in rare instances will adjustment be needed in the counterclockwise direction.

4. Move centerline of small wheels of wheelchair (with passenger) to within 24 inches of doorway and repeat aiming procedure in previous step.



TWS MODULE DETAIL 23368

Test Aim of Acoustic Sensor Beam

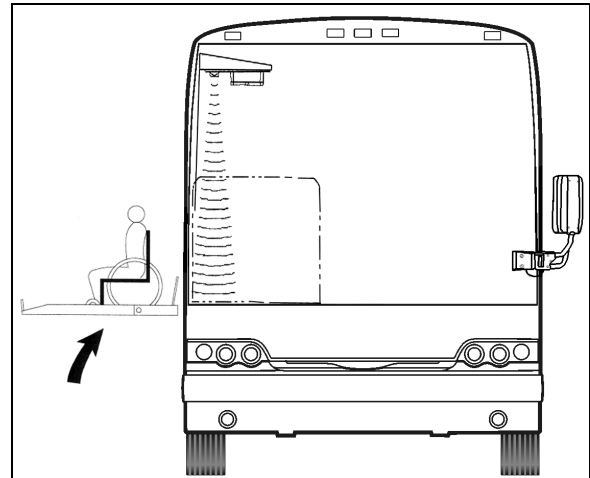
1. Move wheelchair and passenger slowly towards doorway. TWS should detect wheelchair and passenger (LED will flash, buzzer will sound and the module red light will flash) when centerline of front wheels is between 18 and 24 inches from doorway.
2. Open vehicle access door above lift. Lower platform to ground and place wheelchair and passenger at rear of platform. Rollstop (rear barrier) should be up. Raise platform to floor level. This normal platform motion with wheelchair and passenger aboard should not actuate TWS. If LED does flash (buzzer will also sound and module red light will flash), turn sensor adjustment screw slightly counterclockwise.

NOTE
If an adjustment is made, repeat the previous step where wheelchair is between 18 and 24 inches from doorway.

Adjust Acoustic Sensor Timing

1. Support a flat sheet of cardboard, or similar material, directly beneath TWS module at a distance of 4½ feet below module. Sheet must be facing sensors.

NOTE
Before proceeding, visually inspect sensors to verify that they are pointing directly at floor, or nearly, and are not pointing off at an extreme angle.



CHECKING NORMAL PLATFORM POSITION 23372

2. Note the sensor timing access hole. This hole provides access to a plunger-actuated switch that sets the sensor timing. Insert a 1/16-inch diameter wire-like object into the access hole and press the plunger inward. The LED will flash momentarily while the module establishes the distance and then remain on steady. Release the plunger when the LED ceases to flash.

NOTE
It is important that objects, such as your body, tools, seats, etc, do not interfere with the beam while the adjustment is being made.

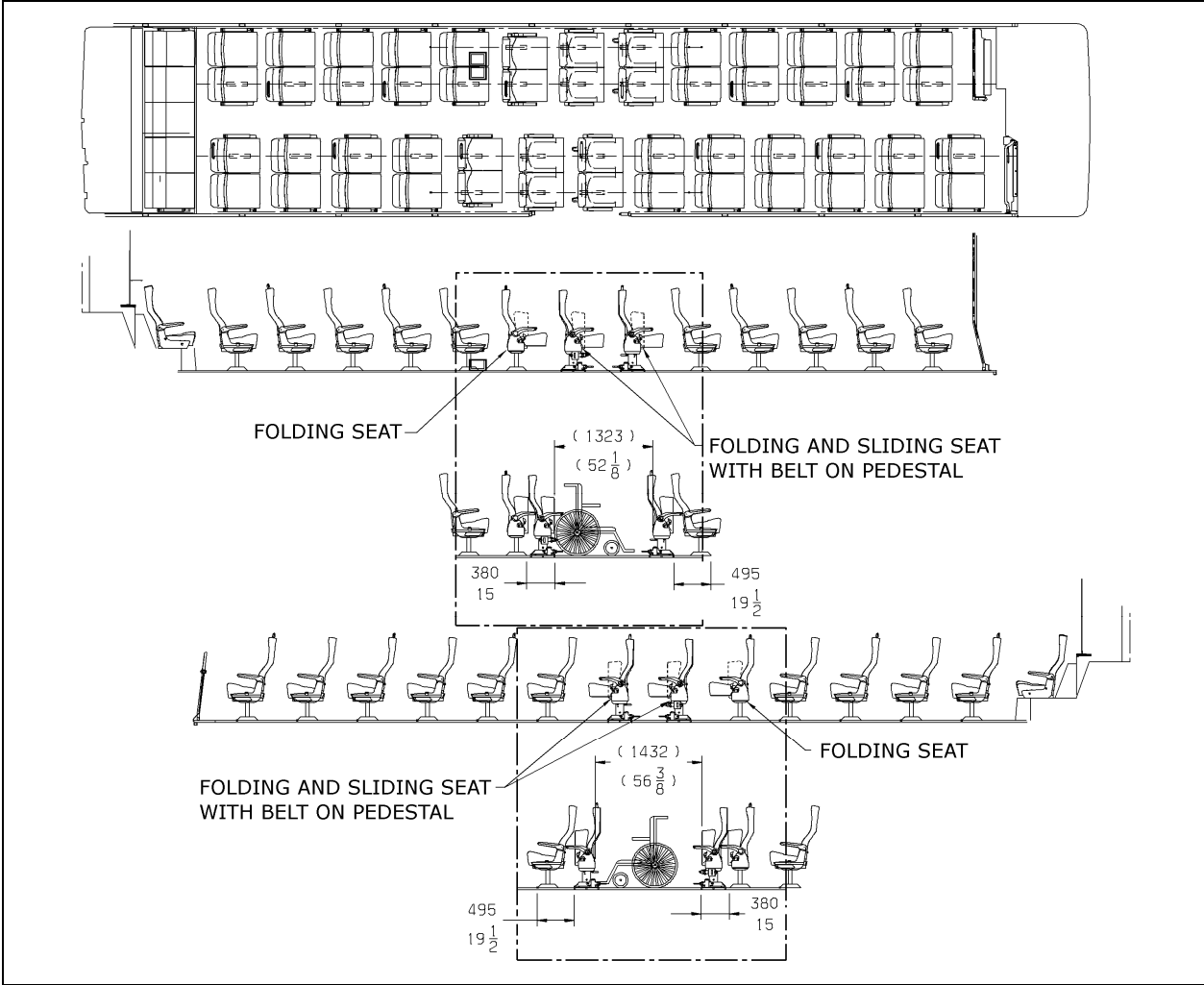
INTERIOR APPOINTMENTS

To accommodate a wheelchair, three rows of regular seats on one side of the coach must be folded and slid away. Seats may be folded on both sides of the coach to make room for a second wheelchair.

An electrical wheelchair or tri-wheeler may require sliding back seats from both sides of the coach to allow enough turnaround space.

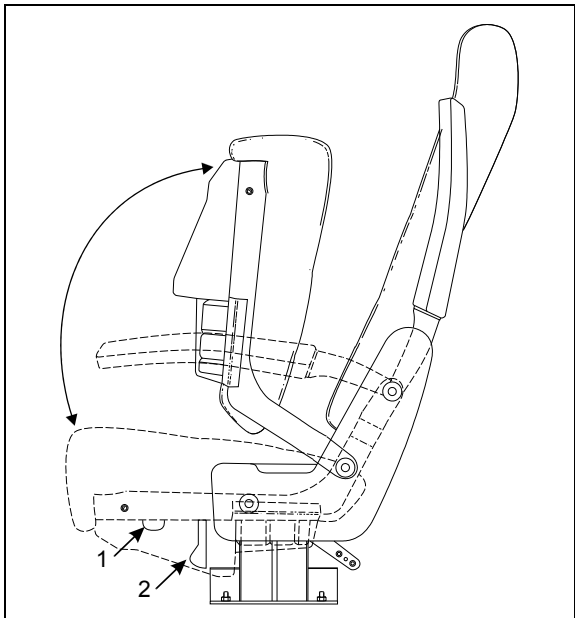
To fold a set of seats, raise the seat back then lift up the seat cushion (pull on lever 1). To slide a row of seats, remove the black covers from the floor tracks. Pull the lever 2 while sliding the seat along the track.

The wheelchair occupants have a stop request and a reading light switch at their disposal on the window sill of the coach, within easy reach.



POSSIBLE SEATING ARRANGEMENTS

23259



FOLDING SEATS

18430

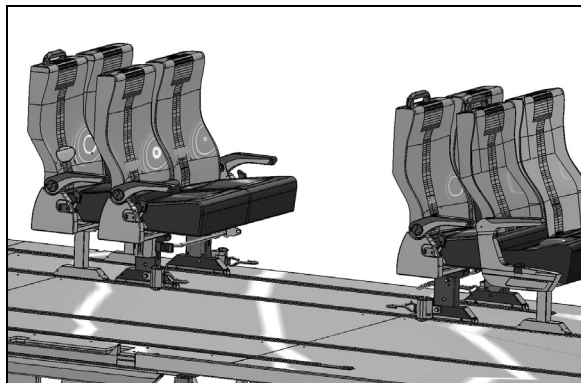
Accommodating a Wheelchair



FOLDING & SLIDING SEATS LOCATION

Locate the folding and sliding seats.

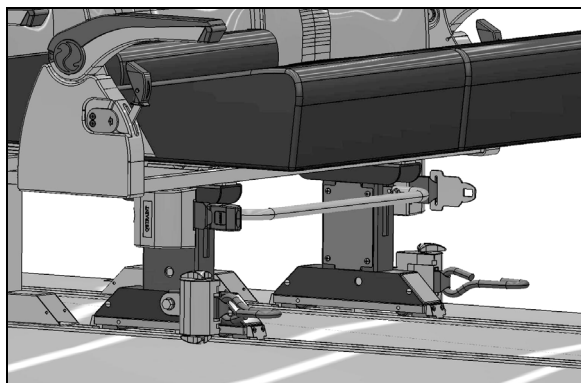
Slide rows of seats to accommodate the wheelchair.



SEATS FOLDED AND SLID

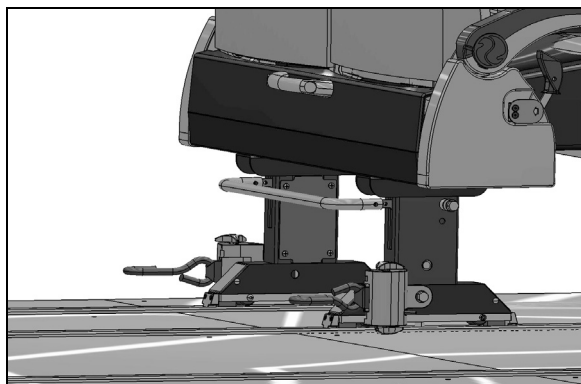
Wheelchair Restraint System

This 4-point anchoring system includes four retractors with restraint belts located at the base of passengers seats, which must be used (at all four corners) to secure each wheelchair.



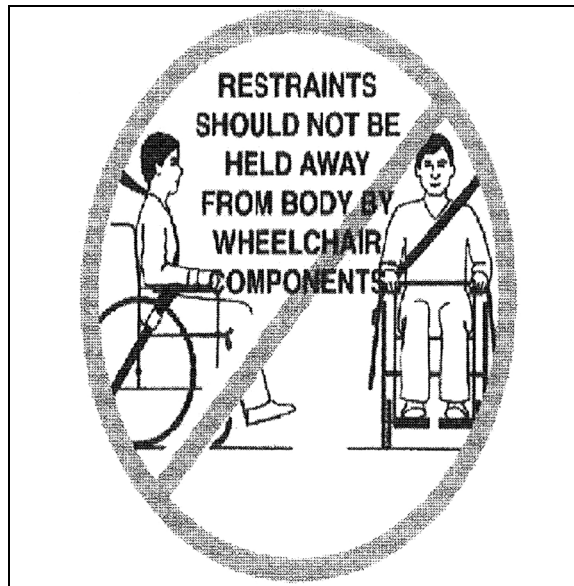
WHEELCHAIR ANCHORING SYSTEM (REAR PORTION)

Secure each hook to each corner of the wheelchair frame (DO NOT USE WHEELS) and allow the retractors to tension the belts.



WHEELCHAIR ANCHORING SYSTEM (FRONT PORTION)

To remove the restraint belts, lower releasing lever. Free hooks from wheelchair to allow the belts to retract and guide the belts in, making sure they remain untwisted as they retract.



IMPROPER BELT POSITIONING

23262

Wheelchair Occupant Restraint

Secure the wheelchair occupant in the following manner:

Fasten and adjust the lap belt so it sits snug across the hips. Locate buckle on the center aisle side. Snap the shoulder belt to the attachment on the lap belt. A retractor adjusts shoulder belt length automatically.



CAUTION

Lap belt buckle including red releasing button must always be located on the center aisle side.

To release the belt, unsnap the shoulder belt then press the red button in the center of the buckle.



WARNING

A snug fit with the lap belt positioned low on the hips is necessary to maximize safety. The belt should not be worn or twisted. Avoid pinching the belt and/or hardware. Do not wear over rigid or breakable objects such as eyeglasses, pens or keys as these may cause injuries.



WARNING

Do not let restraint or safety belts rub against sharp edges. Do not bleach or dry clean.

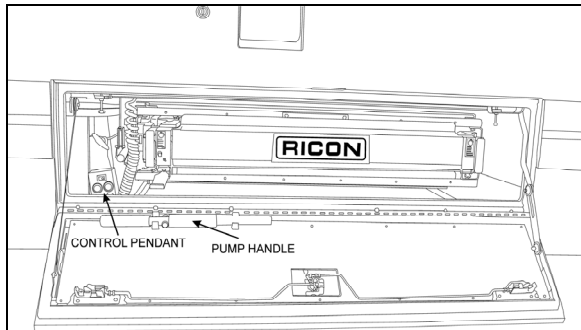
EMERGENCY OPERATION

In the event of electrical power loss, manual operation of the lift is possible as explained below.

To manually deploy the platform

Allow enough space for lift operation and passenger boarding. If a break down situation exists and the vehicle cannot be moved so that the lift system can be operated safely, the operator must summon emergency assistance to move the vehicle before operating the lift.

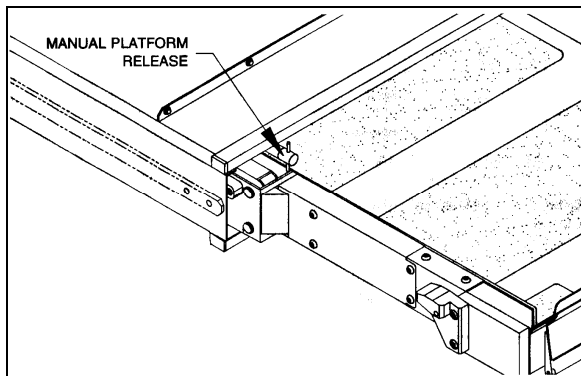
Fully open wheelchair access and lift doors. Ensure that there are no obstacles in the path of the lift.



WHEELCHAIR LIFT MANUAL OPERATION 23375

Remove the pump handle from inside the lift mechanism access door.

Turn one of the manual platform release shafts using pump handle extension.



MANUAL PLATFORM RELEASE SHAFT 23334

Grasp the platform and pull firmly until the lift is all the way out against the carriage stops.

To manually raise the platform

Remove the pump handle from inside the lift mechanism access door.

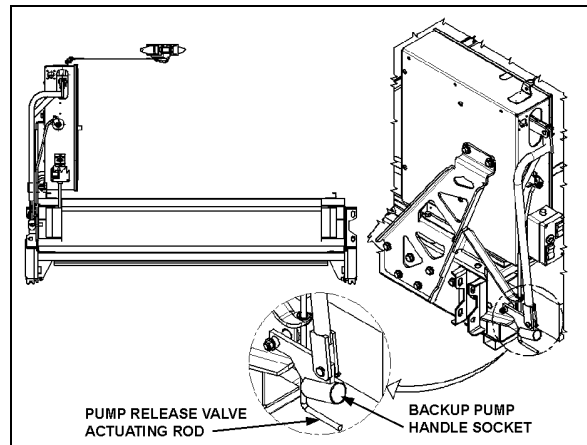
Push the pump release valve actuating rod UP.



CAUTION

During manual rising of the lift, do not raise the platform more than 1-1/2 inches above the vehicle floor level. Any excessive travel will make it difficult to enter the platform and/or damage the lift bridge plate actuator. The outer edge of the bridge plate must rest squarely on the vehicle floor.

Insert handle extension into manual backup pump handle socket and pump to raise the platform to the vehicle floor level.



WHEELCHAIR LIFT MANUAL HYDRAULIC PUMP 23373

The lift passenger and attendant must follow the instructions to ENTER or EXIT the vehicle, as previously described.

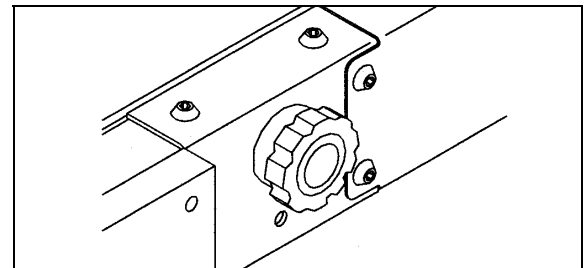
To manually lower the platform

Slowly pull the pump release valve actuating rod DOWN until the platform begins to lower.

Allow the platform to reach ground level.

Push the pump release valve actuating rod back UP until lightly-snug.

Using the rollstop manual control knob and one hand on the rollstop, OPEN the rollstop.



ROLLSTOP MANUAL CONTROL KNOB 23275

The attendant and lift passenger should follow the instructions to ENTER or EXIT the vehicle, as described previously.

To manually stow the platform

Raise or lower the platform to the deploy/stow position; the platform frame must be parallel to the side of the lift enclosure. If the exact position cannot be obtained, slightly low is preferred to slightly high.

Using the rollstop manual control knob and one hand on the rollstop, close the rollstop until it latches.

Use one person on each side of the lift to prevent mechanical binding.

With fingers up and palms forward, push the platform forcefully to start the lift moving inward. As the lift begins to move inward, maintain a constant pushing motion until the lift comes to rest completely inside the lift enclosure.


Push firmly and make sure that the platform manual release shafts have turned to lock the platform.

To manually stow the lift from ground level

In the unlikely event of a hydraulic system failure and the manual backup pump is inoperative, the lift may be stowed as follows by **two or more able-bodied people**:

Raise or lower the platform to the deploy/stow position; the platform frame must be parallel to the side of the lift enclosure. If the exact position cannot be obtained. Slightly low is preferred to slightly high.

Using the rollstop manual control knob and one hand on the rollstop, close the rollstop until it latches.

 <p>WARNING</p>
<p>The platform is heavy and should be lifted using caution and proper lifting technique: Always lift with legs and not the back when attempting to lift heavy objects.</p>

Use one person on each side of the lift to prevent mechanical binding.

With fingers up and palms forward, push the platform forcefully to start the lift moving inward. As the lift begins to move inward, maintain a constant pushing motion until the lift comes to rest completely inside the lift enclosure.

Push firmly and make sure that the platform manual release shafts have turned to lock the platform.

WHEELCHAIR LIFT REMOVAL FOR STORING OR MAINTENANCE PURPOSES


Disconnect connector located at compartment ceiling.


Remove 4 fixing bolts located inside compartment, on each side of platform.

Grasp the platform and pull firmly, sustaining a constant pull so that the platform slides onto the rails until the carriage come in contact with the stops.

Pull the platform until the rear carriage hit against the stops.

Remove platform completely.

 <p>WARNING</p>
<p>For better stability, keep the platform at minimum height when moving.</p>

 <p>WARNING</p>
<p>Before moving platform, make sure that floor is level and free of obstacles.</p>

WHEELCHAIR LIFT INSTALLATION

Raise the platform to proper level.

Insert the platform so that the rear carriage clears the stops.


Insert the platform until the front carriage clears the stops.

Lower the front of the platform.

Push firmly and make sure that the platform manual release shafts have turned to lock the platform.

Secure the 4 fixing bolts located inside compartment, on each side of platform. **Apply a torque of 60 lbf-ft.**

Reconnect connector located at compartment ceiling.

 <p>WARNING</p>
<p>When re-inserting platform into compartment, make sure that carriage wheels are properly aligned over the L. H. side triangular rail.</p>